Electronic Journal of Linear Algebra, 2014, vol.27, pages 534-556

# Strong power and subexponential laws for an ordered list of trajectories of a markov chain

Bochkarev V., Lerner E.
*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

## Abstract

© 2014, International Linear Algebra Society. All rights reserved. Consider a homogeneous Markov chain with discrete time and with a finite set of states E0, . . . ,En such that the state E0 is absorbing and states E1, . . . ,En are nonrecurrent. The frequencies of trajectories in this chain are studied in this paper, i.e., “words” composed of symbols E1, . . . ,En ending with the “space” E0. Order the words according to their probabilities; denote by p(t) the probability of the tth word in this list. As was proved recently, in the case of an infinite list of words, in the dependence of the topology of the graph of the Markov chain, there exists either the limit ln p(t)/ ln t as t ! ∞ or that of ln p(t)/t1/D, where D ∈ ℕ (weak power and subexponential laws). As appeared, in the latter case the decreasing order of the function p(t) is always subexponential (the strong subexponential law). In the first case, this paper describes necessary and sufficient conditions of the power order (the strong power law). These conditions are fulfilled, in particular, if the graph of the Markov chain that corresponds to states E1, . . . ,En is strongly connected.

## Keywords

Directed graphs, Markov chains, Strong power laws, Substochastic matrices